CLAIMS

1. An airbag module for protecting an occupant of a vehicle from impact, the airbag module comprising:

a cushion comprising a divider that defines a first chamber and a second chamber within the cushion;

an inflator that produces inflation gas in response to receipt of an activation signal; and

a housing comprising a first aperture and a second aperture, wherein the housing is shaped to retain the inflator at any of a plurality of positions to enable tuning of a flow rate of a first flow of inflation gas into the first chamber via the first aperture and tuning of a flow rate of a second flow of inflation gas into the second chamber via the second aperture.

2. The airbag module of claim 1, wherein the airbag module is a side airbag module to be installed in a vehicle feature selected from the group consisting of a seat occupied by the occupant, a door of the vehicle, a B pillar of the vehicle, a C pillar of the vehicle, and a D pillar of the vehicle, wherein the first chamber comprises a pelvic chamber shaped to inflate alongside a pelvis of the occupant and the second chamber comprises a thoracic chamber shaped to inflate alongside a thorax of the occupant.

3. The airbag module of claim 2, wherein the inflator is positioned within the housing such that the pelvic chamber inflates to a higher pressure than a pressure to which the thoracic chamber is inflated.

4. The airbag module of claim 2, wherein the housing is disposed within the cushion.

5. The airbag module of claim 4, wherein the housing comprises an elongated shape and the cushion comprises a mounting region having a length sufficient to permit lengthwise positioning of the housing at a plurality of locations within the mounting region to permit installation of the housing at a plurality of locations with respect to a seat of the vehicle.

6. The airbag module of claim 2, wherein the housing comprises a mounting feature disposed to facilitate attachment of the housing to the seat.

7. The airbag module of claim 6, wherein the mounting feature comprises a stud, wherein the cushion comprises an opening in communication with the second chamber, wherein the stud protrudes from the cushion and the cushion is folded over the stud to prevent gas from escaping the cushion via the opening.

8. The airbag module of claim 1, wherein the housing comprises a retention ridge extending inward to retain the inflator generally coaxial with the housing, wherein the plurality of positions are displaced from each other along an axis of the housing.

9. The airbag module of claim 1, wherein the inflator comprises an outlet orifice and the housing has a generally tubular shape with a first end, a second end, and a curved wall extending between the first and second ends, wherein the first aperture is defined by the first end and the second aperture is formed in the curved wall such that the outlet orifice is disposed generally between the first and second apertures.

10. The airbag module of claim 1, wherein the cushion comprises an outer wall having an opening in communication with the second chamber, wherein the divider comprises an end adjoining the mounting region, the end having an insertion surface and a resting surface, wherein the insertion surface is disposed to permit translation of the housing through the opening and between the insertion surface and the outer wall, wherein the resting surface is disposed to permit subsequent rotation of the housing to dispose the housing between the resting surface and the outer wall to substantially prevent gas flow between the first and second chambers, outside the housing.

11. The airbag module of claim 1, wherein the divider abuts the housing to restrict gas flow between the first and second chambers to enable maintenance of a pressure differential between the first and second chambers for at least about fifty milliseconds.

12. The airbag module of claim 11, wherein the housing and the inflator are relatively sized to provide a constricted flow path between the first and second chambers, through the housing, to restrict gas flow between the first and second chambers.

13. The airbag module of claim 11, wherein the housing is disposed to receive heat directly from the first and second flows, thereby cooling the first and second flows during motion of the first and second flows toward the first and second chambers, respectively.

14. An inflation assembly for an airbag module for protecting an occupant of a vehicle from impact, the airbag module comprising a cushion, the inflation assembly comprising:

an inflator that produces inflation gas in response to receipt of an activation signal; and

a housing comprising a first aperture and a second aperture, wherein the housing is shaped to retain the inflator at any of a plurality of positions such that, at each position, a first flow of inflation gas exits the housing via the first aperture and a second flow of inflation gas exits the housing via the second aperture in response to deployment of the inflator;

wherein positioning the inflator with respect to the housing tunes a flow rate of the first flow with respect to a flow rate of the second flow.

15. The inflation assembly of claim 14, wherein the housing comprises a retention ridge extending inward to retain the inflator generally coaxial with the housing, wherein the plurality of positions are displaced from each other along an axis of the housing.

16. The inflation assembly of claim 14, wherein the inflator comprises an outlet orifice and the housing has a generally tubular shape with a first end, a second end, and a curved wall extending between the first and second ends, wherein the first aperture is defined by the first end and the second aperture is formed in the curved wall such that the outlet orifice is disposed generally between the first and second apertures.

17. An inflation assembly for an airbag module for protecting an occupant of a vehicle from impact, the airbag module comprising a cushion, the inflation assembly comprising:

an inflator comprising an outlet orifice through which inflation gas exits the inflator in response to receipt of an activation signal; and

a housing within which the inflator is disposed, the housing having a generally tubular shape with a first end, a second end, and a curved wall extending between the first and second ends, the housing comprising a first aperture defined by the first end and a second aperture formed in the curved wall such that the outlet orifice is disposed generally between the first and second apertures;

wherein, in response to deployment of the inflator, a first flow of inflation gas exits the housing via the first aperture and a second flow of inflation gas exits the housing via the second aperture.

18. The inflation assembly of claim 17, wherein the first aperture has a generally circular shape.

19. The inflation assembly of claim 17, wherein the housing is shaped to permit the second flow to move along a generally annular pathway between the housing and the inflator to reach the second aperture.

20. The inflation assembly of claim 17, wherein the cushion comprises a divider that defines a first chamber and a second chamber within the cushion, wherein the first flow enters the first chamber and the second flow enters the second chamber such that the first chamber is inflated to a pressure higher than a pressure to which the second chamber is inflated.

21. The inflation assembly of claim 20, wherein the first aperture is disposed within the first chamber and the second chamber is disposed within the second chamber.

22. A side airbag module for protecting an occupant of a seat of a vehicle from impact, the airbag module comprising:

a cushion comprising a divider that defines a first chamber and a second chamber within the cushion, the cushion having a mounting region that traverses the divider;

an inflator that produces inflation gas in response to receipt of an activation signal; and

a housing within which the inflator is disposed, wherein the housing is disposed within the mounting region, the housing comprising a first aperture disposed within the first chamber, a second aperture disposed within the second chamber, and a mounting feature disposed to facilitate attachment of the housing to the seat;

wherein the housing comprises an elongated shape and the mounting region has a length sufficient to permit lengthwise positioning of the housing at a plurality of locations within the mounting region to permit installation of the housing at a plurality of locations with respect to the seat, independent of a position of the cushion with respect to the seat.

23. The side airbag module of claim 22, wherein the cushion comprises an outer wall in which an opening is formed in communication with the second chamber, wherein the mounting feature extends through the outer wall to facilitate sealing of the cushion opening and attachment of the housing to the seat.

24. The side airbag module of claim 22, wherein the housing has a length sufficient to permit attachment of the mounting feature to the housing at a plurality of locations along the length.

25. The side airbag module of claim 22, wherein the first chamber comprises a pelvic chamber shaped to inflate alongside a pelvis of the occupant and the second chamber comprises a thoracic chamber shaped to inflate alongside a thorax of the occupant, wherein the inflator is positioned within the housing such that the pelvic chamber inflates to a higher pressure than a pressure to which the thoracic chamber is inflated.

26. A method for controlling inflation gas flow into a cushion of an airbag module for protecting an occupant of a vehicle from impact, the cushion comprising a divider that defines a first chamber and a second chamber, the airbag module further comprising an inflator that produces inflation gas in response to receipt of an activation signal and a housing shaped to retain the inflator at any of a plurality of positions, the method comprising:

establishing a first desired pressure to which the first chamber is to be inflated and a second desired pressure to which the second chamber is to be inflated;

determining which position of a plurality of positions of the inflator with respect to the housing will most nearly provide the first and second pressures; and

installing inflator at the determined position within the housing.

27. The method of claim 26, wherein the cushion further comprises a mounting region that traverses the divider, the method further comprising installing the housing and the inflator within the mounting region.

28. The method of claim 27, further comprising attaching the cushion to the seat such that the cushion forms a side airbag and the first chamber comprises a pelvic chamber shaped to inflate alongside a pelvis of the occupant and the second chamber comprises a thoracic chamber shaped to inflate alongside a thorax of the occupant.

29. The method of claim 28, wherein establishing the first and second desired pressures comprises making the first pressure greater than the second pressure.

30. The method of claim 26, wherein the housing further comprises a retention ridge extending inward, wherein the plurality of positions are displaced from each other along an axis of the housing, wherein installing the inflator at the determined position within the housing comprises disposing the inflator such that the retention ridge grips the inflator to maintain the inflator generally coaxial with the housing.

31. The method of claim 26, wherein the inflator comprises an outlet orifice and the housing comprises a first end, a second end, and a curved wall extending between the first and second ends, the housing further comprising a first aperture defined by the first end, in communication with the first chamber, and a second aperture formed in the curved wall, in communication with the second chamber, wherein installing the inflator at the determined position within the housing comprises disposing the outlet orifice generally between the first and second apertures.

32. A method for assembling an airbag module for protecting an occupant of a vehicle from impact, the airbag module comprising a cushion, an inflator, and a housing, the cushion comprising an outer wall and a divider that defines a first chamber and a second chamber within the cushion and an opening formed in the outer wall in communication with the second chamber, the cushion having a mounting region that traverses the divider, the divider comprising an end adjoining the mounting region, the end having an insertion surface and a resting surface, the method comprising:

inserting the inflator into the housing;

inserting the housing and the inflator into the mounting region such that the housing is in contact with the outer wall and the insertion surface; and

rotating the housing and the inflator into alignment with the mounting region such that the housing is in contact with the outer wall and the resting surface to substantially prevent gas flow between the first and second chambers, outside the housing.

33. The method of claim 32, wherein the housing comprises a first aperture and a second aperture, wherein inserting the housing and the inflator into the mounting region comprises disposing the first aperture within the first chamber and disposing the second aperture in the second chamber.

34. The method of claim 32, wherein the airbag module is a side airbag module to be installed in a seat occupied by the occupant, wherein the housing comprises a mounting feature disposed to facilitate attachment of the housing to the seat, the method further comprising folding the cushion over the mounting feature to prevent gas from escaping the cushion via the opening.